RUC the Swedish way

arena

ARENA REPORT 2011.05  2011-03-31
Introduction

Direct Road User Charges, i.e. congestion tax, road tolls and other fees levied on road usage, find increased use in Sweden and abroad. Huge efforts are now made to create a situation where the payment process is made easy and does not interfere with the driver’s other tasks. In order to stand prepared for the expected development, the Swedish Transport Administration and the Swedish Transport Agency has developed a joint position concerning how collection of road user charges shall be applied in Sweden in the coming years.

This brochure outlines a comprehensive future national Swedish road user charging system that allows for integration of new services, and is coordinated with ongoing developments in the Nordic region and in Europe.

Road User Charges – A background in Transport Policy Development

The Swedish transport policy aims at a sustainable road transport system. This means a well functioning road infrastructure providing efficient accessibility for citizens and the industry, balanced by measures in support of road safety and reduction of the environmental impact from transport.

The demand for road transport, including passenger as well as goods transport, has historically increased at pace with economical growth and this growth is expected to continue although with reduced force. Following international expectations, road transport is expected to grow with approximately 50% during the next 20 years, which puts the transport policy goals at risk: Increasing climate gas emissions, congested roads and other negative external effects can be expected if counter measures are not applied.

- Apart from infrastructure investments, the Swedish transport policy has always included financial measures to mitigate negative effects from road transport. Internalization of external costs has been a policy guideline for the last 30 years, and fees and taxes play important roles in this respect. Although not in wide-spread use, also direct road user charges are levied in the Swedish road transport system: A time-based road user charge (the Eurovignette) is applied on heavy goods vehicles with a maximum laden weight of 12 tons or more since 1998. Foreign vehicles are obliged to pay for use of the TEN-T road network, while the duty concerns all roads for domestic vehicles. Road tolls are used in order to finance specific infrastructural investments as the Öresund (since 2000) and Svinesund (since 2005) bridges.

Congestion tax is applied in Stockholm since 2007 in order to safeguard mobility through demand management, and finance investments in complementary measures in the transport system as a whole.

---

1 Installations of road user charging systems in Stockholm and at the Svinesund and Öresund bridges are currently not designed in full compliance with this description
Road User Charges will play an increasingly important role in the future

In Sweden, as in many other countries, the competition for public resources gets harder. This concerns in particular infrastructure development, where costs are increasing rapidly due to the complexity of new investments. Following the adoption of the 2008/2009 Transport Policy, *Travel and Transport in the Future*, and the subsequent *Infrastructure plan* (2010), stakeholders’ co-financing of infrastructure investments has gained increased importance. In many cases direct road user charges (road tolls) are planned to be introduced as part of such co-financing packages.

The introduction of legislation for the European Electronic Toll Service (EETS) puts new requirements on the Swedish government. It is also clear that plans for distance based road user charges for Heavy Goods Vehicles in neighbouring countries and the gradual deterioration of fossil fuel as an important tax base support a renewed interest for direct road user charges in Sweden.

The current situation

Sweden today

In Sweden, road tolls are used to finance the Öresund and the Svinesund bridges. Both these bridges are operated by concessionaires with the Swedish State as a shared owner. Presently several new infrastructure investments are planned to be financed through road tolls, including:

- Bridge over Motalaviken (from 2012),
- Bridge over Sundsvallsfjärden (from 2013)

In 2007 Stockholm permanently implemented a congestion charging scheme, following a large scale trial period. Gothenburg is planning to introduce congestion charging in 2013 in a scheme similar to Stockholm, but with some important changes: as the presence of foreign vehicles is more prominent in Gothenburg than in Stockholm, current plans also include these vehicles to be subject to the tax.

Sweden is a member of the Eurovignette cooperation (together with Belgium, Denmark, Luxembourg and the Netherlands). While domestic vehicles are required to pay the Eurovignette fee for use of any road in the country, foreign vehicles are liable to pay only for the use of the Swedish motorway network. In 2005 Sweden investigated the possibility to develop the E6 between Gothenburg and the Svinesund Bridge with the help of road tolls, but this was found to be in conflict with the Eurovignette directive as it is in general not permitted to apply parallel road user charges on the same road.²

In 2006 the Swedish parliament voted in favour of the introduction of a kilometer tax for Heavy Goods Vehicles. However, apprehension of negative effects to certain regions and branches of industry called for in depth investigations. The results from these investigation raised concerns and the implementation was halted.

² With the exception of bridges, tunnels, mountain passes etc.
The Nordic countries – the EasyGo cooperation

Sweden, Denmark and Norway are already operating the EasyGo service which allows for roaming drivers to pay their road tolls against a single invoice, using the same on board equipment with a single contract arrangement. Approximately 1.5 million vehicles in the Nordic countries are using this service on toll bridges and toll roads which is currently investigated to expand to include also the Austrian motorways.

The European progress

The development in Sweden is by no means unique. Only in Europe, 21 countries have already introduced various kinds of road user charging schemes and the number of implementations is increasing.

The German distance based road user charging system Lkw-Maut was introduced in 2005 for heavy goods vehicles above 12 tons on the motorways and some highly frequented primary roads. Frequent users have installed an on-board unit which allows automatic charging based on GNSS-positioning and GPS communication. Many Swedish vehicles in international traffic have installed the German on-board unit. The trucks pay between €0.09 and 0.14€ per kilometre depending on their emission levels and number of axles and the revenue is used for motorway maintenance and expansion.

In France, each vehicle, both domestic and foreign with a maximum laden weight over 3.5 tons will be required by law to have an OBE installed from 2011. A distance based road user charge covering the state road network and local governments’ roads will be introduced in parallel to the existing toll road network. The scheme is supposed to encourage a modal shift, from road to rail, to reduce CO2 emissions and to finance intermodal transport policy measures.

Poland decided in October 2010 to introduce distance based road user charging of all trucks and buses above 3.5 tons by 1 July 2011 on a total of 2,000 kilometres of highways, 5,000 kilometres of motorways and 600 kilometres of lower class roads. A system based on Global Navigation Satellite System (GNSS) technology was rejected in favour of the more conventional Dedicated Short-Range Communication (DSRC) technology.

Our close neighbours: Norway is considering compulsory use of OBE for all heavy goods vehicles and has recently made an investigation on the introduction of a distance based road user charge for heavy goods vehicles. Denmark plans to introduce a nationwide distance based road user charging scheme for HGVs in 2013, as part of a tax reform. Initial plans also included charging passenger cars three years after the introduction for heavy goods vehicles, but this extension has been postponed.

The European Electronic Toll Service - EETS

The increased implementation of direct Road User Charging in Europe triggered the European Commission to initiate a process to prevent a continued fragmentation of Electronic Fee Collection systems in Europe. In 2004, the European Electronic Toll Service was launched as a product of the EFC Directive\(^3\). The main objective of EETS is to apply the principle of one contract - one vehicle equipment - one invoice into European road user

---

\(^3\) Directive 2004/52/EC
charging. This implies that it should be possible for vehicles to travel all over Europe, visiting numerous toll areas, and only have one On Board Equipment (OBE) installed in the vehicle, one service contract, and get all toll payments on one invoice. The EETS shall be available across Europe for Heavy Goods Vehicles from 2012, and for all vehicles from 2015.

The EETS has been implemented in Swedish legislation and forms an important basis for the proposed Swedish road user charging system.

Requirements on the Swedish RUC System

Each installation of road user charging will be based on its own specific local requirements reflecting local needs and restrictions. There is however a set of requirements that can be seen as universal for all systems in Sweden, and form the basis for a national road user charging system:

The road user shall perceive an integrated system

Road User charging in Sweden includes congestion tax, bridge and road tolls and possibly distance based charges in the future. A basic requirement is that the road users shall experience a single interface to the services received, and be able to use a singular electronic device for all payments.

The customer shall meet a single point of contact

As a customer, you shall receive only one invoice including all payments due, and you shall be able to address a singular contact point with information queries, questions, complaints on invoices etc.

The system shall be interoperable with EasyGo and EETS

Travelers from abroad with contracts and equipment associated with the EasyGo or EETS service shall experience full interoperability in Swedish RUC installations.

The system shall allow for equal treatment of all road users

The EETS does not allow for discrimination between frequent and temporary users of a toll service. Similarly, the Swedish road user charging system shall include the components required to manage all vehicles, regardless of origin, using the different services. Whether or not to exempt a certain category of vehicles (e.g. foreign) shall be a policy decision and not follow from system limitations.

The system shall be cost efficient

All elements of the Swedish road user charging system shall be designed to operate at low cost, and there shall be a continuous strive for improved efficiency.

The system shall comply with standards and use open interfaces

International standards shall be fully applied in the Swedish RUC system, and interfaces in the system shall be based on open specifications.

The system shall be flexible and allow for evolution
The Swedish road user charging system shall allow for competing technologies and suppliers within the agreed technical framework, in order to stimulate technical and organizational development of equipment and services.

**RUC the Swedish way**

Taking into account the international development and the requirements set, a proposal for a comprehensive Swedish Road User Charging system has been developed. The proposal, which is presented below, is best characterized by two keywords: Competition and interoperability.

**Technology**

The Swedish RUC system is based on vehicle registration through either video images or reading of DSRC transponders. Presence of a transponder, from an EasyGo or EETS issuer, will supersede a license plate reading. The Swedish system is prepared for the introduction of distance based charging schemes using satellite based positioning in combination with cellular network technologies.

**Free flow technology**

Toll stations are designed for free flow technology, thus allowing for uninterrupted traffic through the toll stations.

**Automatic License Plate Reading (ANPR)**

Images of license plates are recorded by video at toll stations and the license plate is decoded through optical character recognition. Each license plate, also foreign, is linked to an account by the Swedish Transport Agency. ANPR is considered to be the main solution for Swedish passenger cars at all inland toll stations, and is currently used in the Stockholm Congestion Tax scheme.

**Dedicated Short Range Communication (DSRC)**

Toll stations are equipped with DSRC transceivers parallel to the video image recorders. Vehicles that are equipped with DSRC transponders will be managed through their associated contracts with EETS or EasyGo Toll Service Providers.

**EasyGo subscriber lists**

---

4 GSM, 3G, 4G
5 Hence excluding the Svinesund and Öresund Bridges
6 BroBizz (SE, DK), Autopass (NO), GO-Box (AT)
RUC the Swedish Way

A vehicle that is registered for an EasyGo subscription will always be charged through the EasyGo account system, even if the transponder is not correctly read at the Toll Station. All EasyGo subscriptions are available for cross-check by the Toll Charger.

Control and enforcement

Vehicles for which payment obligations have not been fulfilled are black-listed, and will be subject to enforcement procedures which depend on the legal status of the unpaid fee (whereas a tax has higher priority than a fee). Evidence on passages (e.g. images from toll station passages) will be stored depending on nature of road user charge.

GNSS in combination with DSRC and Cellular Networks

Satellite based and/or Cellular Network based systems may be introduced in the future to account for distance based charging regimes. In accordance with EETS, the Swedish system will be prepared for also clients in distance based charging schemes where the information, including e.g. a travel path, can be communicated over a cellular network.

Open interfaces and agreed specifications

All elements of the Swedish Road User charging system shall be based on defined profiles within standards, and on open interface and security specifications.

Organization

A singular operator of the Toll Charger function

The Toll Charger function is centralized to the Swedish Transport Agency, being responsible for management of accounts based on license plates and corresponding invoices. The Swedish Transport Agency is also administrator of Swedish Toll Domain Statements and contract arrangements with EasyGo and EETS partners. Transport Agency may delegate the specific operation of a toll station to a contractor.

Competing Toll Service Providers

The Swedish approach is positive towards the establishment of multiple professional Toll Service Providers specializing in management of contracts and vehicle equipment (e.g. transponders) for automated payment. Swedish Toll Stations will accept EasyGo and EETS accounts using DSRC transponders issued by Toll Service Providers across Europe. Customers of Swedish road toll facilities are free to associate with any Toll Service Provider within the EasyGo and EETS frameworks and select upon their commercial offerings.

EETS development through clusters of Toll Service Providers

EasyGo is a cluster of Toll Chargers and Toll Service Providers that offers interoperable road toll payment to a large number of road users in the Nordic countries. The establishment and foreseen growth of EasyGo is seen as a model for the establishment of EETS in Europe. Regional clusters of Toll Chargers and Toll Service Providers, covering large parts of the road users needs, will be established across Europe. They will gradually enter into bi- or multilateral interoperability agreements extending the validity of user contracts and equipment, until Europe is covered.
RUC the Swedish Way

Such process, bringing together clusters rather than individual organizations, focus on road users needs and is a proven concept for success through the EasyGo service.

To summarize

Sweden will face a rapid growth in the use of direct road user charges in the coming years. In order to ensure a smooth introduction of new installations to the benefit of the road users, a comprehensive national scheme is proposed.

All claims will be managed by Swedish Transport Agency, acting as a national Toll Charger. On the road, all toll stations will be equipped for video registration as well as reading of transponders associated with EasyGo or EETS Toll Service Providers. The latter will be the principal method for registration of foreign vehicles. Regardless, the road user will only receive one invoice covering all fees due, either from the Swedish Transport Agency, or from the selected Toll Service Provider. Allowing several TSP’s to operate opens up for competition, which trigger efficiency and innovation. Hence all elements of the Swedish road user charge system must be based on standards and open specifications.
Fact box: Actors in road user charging

*Toll Charger (TC)*

The Toll Charger is the organization providing a transport service (often road usage) to the Service Users against a road user charge.

*Toll Service Provider (TSP)*

The Toll Service Provider is an organization supporting in collecting the payments from the Service Users and forwarding these to the Toll Charger. The TSP may establish a contract with the Service User allowing him to use an electronic OBE and pay fees against an invoice. An EETS Provider is a Toll Service Provider operating Europe-wide and its responsibilities include guaranteeing payments when claimed from the Toll Charger.

*Service User*

The Service User benefits from the transport service, and may sign up with a Toll Service Provider to take advantage of electronic payment using an OBE for toll payments.

Fact Box: DSRC and ANPR

**Dedicated short-range communications (DSRC)** is a wireless communication channel in the 5.8GHz band designed for automotive use. Typically, a transponder (OBE) is mounted on the inside of the vehicle windscreen, communicating with transceivers mounted on gantries above the carriageway.

**Automatic number plate recognition (ANPR)** is a method using optical character recognition on images from toll stations to read license plate information from passing vehicles.
ARENA reports

ARENA REPORT 2010:01 “Transport policy vs. distance-based road user charging tariff scheme design”. Karlsson, M. Sweco Infrastructure.

ARENA RAPPORT 2010:02 ”PM Hantering av utländska fordon i svenska vägavgiftssystem”. Sundberg, J. Sweco Infrastructure. (English translation not available)


ARENA RAPPORT 2011:01 ”PM Distansbaserade vägavgifter”. Forss, M. NetPort.Karlskramn. (English translation not available)


ARENA RAPPORT 2011:03 ”Test Site NetPort - ett försöksområde för ITS”. Clemedtson, P. NetPort.Karlskramn. (English translation not available)


ARENA RAPPORT 2011:06 ”Vägavgifter i praktiken”. Källström, L., Sundberg, J., Forss, M., Clemedtson, P O., Törnquist, J och Löfgren, J.